

Claims

1. An extruder having a plurality of axially parallel, codirectionally rotating shafts disposed in a process chamber between a housing and a core along a circle at equal central-angle distance and equipped with processing elements with which adjacent shafts mesh with each other, whereby axially parallel, circular segment shaped longitudinal depressions are provided for receiving the shafts on the inner side of the housing and the outer side of the core, the housing is composed of housing segments, at least one of which is provided with a heating means, the housing segment at the upstream conveying end has a material feed opening and the discharge is provided at the downstream conveying end, characterized in that the core (4) has outwardly leading cooling channels for a cooling liquid to flow through, at least one housing segment (16 to 19) provided with a heating means (27) has a cooling circuit with axially parallel, circumferentially distributed, interconnected cooling bores (28) for a cooling liquid to flow through on the portion of the housing segment (16 to 19) facing the process chamber (2), and the at least one housing segment (16 to 19) has associated therewith a temperature control device for controlling the heating means (27) and the flow of cooling liquid through the cooling bores (28).
2. The extruder according to claim 1, characterized in that the cooling channels in the core (4) are formed by an axial bore (29) and an outside channel (31) disposed spirally around the axial bore (29), and the coolant is supplied at the downstream conveying end and flows toward the upstream conveying end.
3. The extruder according to either of the above claims, characterized in that the process chamber (2) is sealed by end plates (5, 6) at the upstream and downstream conveying ends.
4. The extruder according to claim 2 or 3, characterized in that the core (4) penetrates the upstream conveying end plate (5), and the cooling liquid feed (32) and the cooling liquid drain (33) are provided at the end of the core (5) protruding from the upstream conveying end plate (5).

5. The extruder according to claim 4, characterized in that the cooling liquid feed (32) and drain (33) are formed by radial bores in a segment (34) which is disposed on the end of the core (4) protruding from the upstream conveying end plate (5).
6. The extruder according to claim 2, characterized in that the outside channel (31) is formed by a spiral groove on the outside circumference of the distributor (99) and sealed by a mandrel (9).
7. The extruder according to claims 1 and 6, characterized in that sleeve-shaped segments (11) are disposed in the end plate (5) so as to form the axially parallel, circular segment shaped longitudinal depressions (13).
8. The extruder according to any of the above claims, characterized in that at least one housing segment (16, 21, 22) has at least one horizontally and/or vertically extending, radial opening (38 to 42) for connecting the process chamber (2) to the outer surroundings.
9. The extruder according to claim 8, characterized in that the opening (38 to 42) is provided with fixed or moving fittings (46) for supplying or removing substances.
10. The extruder according to claim 1, characterized in that at least some of the housing segments (16 to 19, 21, 22) are held together tightly by tie-rods (48) with prestressing.
11. The extruder according to claim 10, characterized in that at least three, preferably four, tie-rods (48) are provided.
12. The extruder according to claim 10 or 11, characterized in that the radial positioning of the housing segments (16 to 19, 21, 22) is effected by the tie-rods (48).
13. The extruder according to any of claims 10 to 12, characterized in that sleeve-shaped filler pieces (63) are provided on the tie-rods (48).

14. The extruder according to any of claims 10 to 13, characterized in that the tie-rods (48) attack at one end the downstream conveying housing segment (16) and at the other end a plate (23) provided on the downstream conveying side of the segment (25) with the material feed opening (26).
15. The extruder according to any of the above claims, characterized in that the segment (25) with the material feed opening (26) is followed on the downstream conveying side by a segment (24) with a funnel-shaped inside wall tapering in the downstream conveying direction.
16. The extruder according to any of the above claims, characterized in that the housing (1) and the core (4) are formed so as to be mutually movable axially on one side.
17. The extruder according to claim 1, characterized in that the discharge is formed by a discharge segment (85), whereby pairs of adjacent shafts (3) extend as double shafts (86) into the discharge segment (85), and the two shafts (3) adjacent the double shafts (86) only up to the discharge segment (85).
18. The extruder according to claim 1, characterized in that the discharge is formed by a discharge segment (85), whereby every second shaft (3) extends into the discharge segment (85), and the other shafts (3) end at the discharge segment (85).
19. The extruder according to claim 17 or 18, characterized in that the discharge segment (85) is provided on the outside circumference with a heating means (27) and/or cooling bores (28) which correspond to the cooling bores (28) of the housing segments (16 to 19).
20. The extruder according to any of claims 17 to 19, characterized in that the discharge segment (85) is fastened to the core (4).
21. The extruder according to any of the above claims, characterized in that the housing segment (16 to 19) is formed on the inner side by a material produced by powder metallurgy and/or has a separate inside body.